

## **Existing and Planned Kootenai River White Sturgeon Research, Monitoring and Evaluation Programs**

The following summaries of research, monitoring and evaluation (RM&E) efforts are all those funded and/or carried out by the action agencies (Bonneville Power Administration (BPA) and the Corps of Engineers (Corps)) necessary to complete the actions identified in their proposed action for the Section 7 re-consultation addressing effects on the Kootenai River white sturgeon resulting from operation of Libby Dam. Results from these efforts will be used to inform and modify existing actions as well as in the design of future actions, as part of the action agencies' overall adaptive management approach in this consultation. The majority of these RM&E efforts are supported by and included in the Kootenai River Subbasin Assessment (NWPCC, 2004).

### **A. Specific ongoing BPA funded research, monitoring, and evaluation activities led by the Kootenai Tribe of Idaho (KTOI) include:**

- Monitor fish community dynamics at index sites on the mainstem Kootenai River. In cooperation with Idaho Department of Fish and Game (IDFG), the Tribe conducts late summer, nighttime electrofishing of near-shore feeding-zone habitats, gillnetting of deep-water habitats, and beach seining of shallow water habitats.
- Monitor fish community dynamics at index sites on selected tributaries of the Kootenai River. The tribe will derive fish community composition and relative abundance by snorkeling techniques and backpack electrofishing techniques.
- Monitor macroinvertebrate community dynamics within the mainstem Kootenai River as part of a pre-nutrient enhancement decision. The Tribe deploys macroinvertebrate samplers during the biologically productive months at sites within representative reaches of the Kootenai River from Libby Dam to Porthill, Idaho, conducts monthly field collections of macroinvertebrate samplers, cleans and sorts macroinvertebrate samples in the laboratory and prepares for identification, and conducts a macroinvertebrate taxonomy and community dynamics analysis.
- Monitor primary productivity, algal community composition, and test nutrient addition effects on these parameters. The Tribe performs mesocosm analysis within key reaches of the Kootenai River in Montana and Idaho.
- Monitor key water-quality parameters at mainstem Kootenai River sites as part of pre-nutrient enhancement decision. The Tribe takes monthly water quality samples during the biologically productive months within key reaches of the Kootenai River in Montana and Idaho, and British Columbia, and ships water-quality samples to certified lab for nutrient and chemical analysis.

- Monitor and evaluate genetic variability and diversity of hatchery white sturgeon juveniles produced and wild brood stock spawned in the Kootenai Hatchery. In cooperation with the University of Idaho, the Tribe optimizes and uses nuclear and mitochondrial DNA marker analyses (sequencing, RFLPs, and microsatellites) to document existing variability and diversity of wild brood stock and hatchery progeny. It compares genetic variability and diversity of hatchery progeny and wild brood stock with that of the wild population to assess genetic representation in hatchery progeny and refine breeding matrix if necessary.
- Monitor and evaluate survival, condition, growth, movement, and habitat use of hatchery-reared juvenile white sturgeon released into the Kootenai River. In cooperation with IDFG and B.C. Ministry of Fisheries, the Tribe samples juvenile white sturgeon to collect information pertaining to life history characteristics using gillnets, hoop nets, and angling. It conducts sonic tracking studies to determine movement and habitat use of juvenile white sturgeon. It evaluates habitat characteristics in areas used by white sturgeon and identifies habitat improvements opportunities and monitors and evaluates juvenile and adult sturgeon and burbot in Kootenay Lake, B.C.
- Monitor and evaluate biological condition and related population dynamics of white sturgeon in the Kootenai River. The Tribe and IDFG determine existing empirical range and variation of growth and condition values of white sturgeon in the Columbia and Kootenai Basin; identify, develop, and rank techniques to determine biological condition as it relates to carrying capacity and associated population dynamics; and evaluate cumulative effects of incremental annual stocking of white sturgeon on growth, condition, and behavioral responses of the hatchery origin and wild population components in the Kootenai River.
- Monitor and evaluate flora and fauna biological condition on habitat mitigation projects. The Tribe will determine baseline Habitat Evaluation Procedures (HEP), using Habitat Suitability Indices (HSIs), to measure enhancements, variation of flora growth and condition values on habitat mitigation projects in the Columbia and Kootenai Basin; identify and develop appropriate HSI models to determine changing biological conditions as they relate to management activities, carrying capacity and associated ecological functions; and evaluate cumulative effects of management activities on vegetative growth, condition, and wildlife responses in the Kootenai River.
- Research, monitor and evaluate the integration of hydraulic-topographic, riparian floodplain and riverine-floodplain food web models via RDRT/AEA process and associated adaptive management strategies and trial restoration experiments. These efforts are to compliment other existing Subbasin project and RM&E work.
- Research, monitor and evaluate riparian and floodplain primary and secondary productivity (e.g., algal, nutrients, birds, etc.), in conjunction with other ongoing project work, to assess ecosystem functions and reconnection opportunities in Kootenai River watershed.

**B. Specific ongoing BPA funded research, monitoring, and evaluation activities led by IDFG include:**

- Monitor and evaluate the size structure of the population of Kootenai River white sturgeon in the Kootenai River and Kootenay Lake. The effort includes periodic estimates of population size of adult and juvenile white sturgeon in the Kootenai River and Kootenay Lake.
- With radio and sonic telemetry, monitor the timing of movement of adult Kootenai River white sturgeon each spring and measure response to flow augmentation and temperature. This effort also collects information pertaining to life history characteristics. The IDFG will continue subcontracting to the B.C. Ministry of Environment for telemetry and juvenile white sturgeon studies in Kootenay Lake.
- Deploy artificial substrate mats and monitor white sturgeon spawning events, locations, habitat (substrate, mid-column velocity, depth, and temperature), and intensity in response to experimental flows.
- Monitor and evaluate larval white sturgeon abundance/year class strength in response to experimental flows.
- Use small-mesh gillnets to monitor and evaluate wild and hatchery white sturgeon year-class abundance, growth, relative weight, and survival in the Kootenai River.

**C. BPA Project 198806400: Kootenai River White Sturgeon Studies and Conservation Aquaculture (KTOI)**

- Monitor, evaluate, and report genetic variability and diversity of hatchery white sturgeon juveniles produced and wild brood stock spawned in the Kootenai Hatchery. (USFWS Recovery Measure 2.23).
- Monitor and evaluate survival, condition, growth, movement, and habitat use of hatchery reared juvenile white sturgeon released into the Kootenai River. (USFWS Recovery Measure 3.31).
- Monitor and evaluate hatchery water quality (USFWS Recovery Measure 2.22).
- Monitor and evaluate animal health of hatchery reared juvenile white sturgeon (USFWS Recovery Measure 2.24.242).
- Monitor and evaluate juvenile and adult sturgeon and burbot in Kootenay Lake, BC.

Research

- Refine elements of white sturgeon conservation aquaculture program using research with direct management implications. (USFWS Recovery Measure 2.24).
  - Investigate cryo-preservation techniques, as well as assessment of viability of sperm collected in the field for Kootenai River white sturgeon.
  - Develop and evaluate permanent tagging or marking technologies or techniques to identify larval, fingerling, and YOY white sturgeon to allow for early release. (USFWS Recovery Measure 2.24.243).
- Investigate factors limiting sturgeon recruitment using research with direct management implications. (USFWS Recovery Measure 2 and 3).
  - Determine mortality, growth, development, and deformity rates for sturgeon sac-fry reared under simulated river conditions and test for metals and organochlorine pesticides in substrates (USFWS Recovery Measure 3.34.342).
  - Conduct analysis of blood and gametes from brood stock fish to determine contaminant levels of metal and organochlorine compounds contributed through gametes to offspring.
  - Correlate survival rate of brood stock families to total parental contributions of metal and organochlorine compounds contributed to offspring through sperm and eggs.
  - Measure and monitor the bioavailability of contaminants related to sediment, organic matter and food-base organisms in the Kootenai River. (USFWS Recovery Measure 3.34.341).

#### **D. BPA Project 198806500: Kootenai River Fisheries Recovery Investigations (KTOI)**

- Monitor and evaluate experimental flows for sturgeon spawning and rearing, determine the minimum flow that will provide spawning and rearing habitat for Kootenai River white sturgeon and bring off a successful year class.

#### **Research**

- Test Null Hypothesis: survival of larval sturgeon released over sand substrate is higher than larvae released over cobble substrate.
- Determine how changes in Kootenay Lake elevation affect white sturgeon spawning location. Will cost share with USGS.

- Evaluate the use of artificial substrates and instream structures to improve white sturgeon egg and larval survival and relocate sturgeon spawning.

#### **E. BPA Project 199404900: Improving the Kootenai River Ecosystem (KTOI)**

- Evaluate the productivity within the Kootenai River before and after implementation of an experimental large-scale ecosystem improvement experiment (Biomonitoring Program).
  - Monitor algal biomass.
  - Monitor chlorophyll “a” concentration.
  - Monitor algal species composition.
  - Monitor macroinvertebrate biomass.
  - Monitor macroinvertebrate species.
  - Monitor fish density and biomass.
  - Monitor fish species/community dynamics.
- Monitor key water quality parameters, with an emphasis on macronutrients.

#### **Research**

- Evaluate the feasibility of a Kootenai River controlled nutrient addition experiment.

#### **F. BPA Project 200200200: Assess Feasibility of Enhancing White Sturgeon Spawning Substrate Habitat, Kootenai R., Idaho (KTOI)**

- Develop sediment-transport models, develop spawning habitat substrate improvement scenarios, and assess the feasibility of habitat enhancement.

#### **G. BPA Project 200200800: Reconnection of floodplain slough habitat to the Kootenai River (KTOI)**

- Evaluate potential slough sites to be reconnected and estimate the ecological benefit reconnection will provide for each potential site.
- Determine the structural and physical feasibility of reconnecting the potential slough sites. River hydraulic data, Surface water profiles, field boring of dike, geotechnical evaluation of the dike, structural concept and design.
- Establish baseline conditions in the area to be reconnected.

- Set up index sites and monitor primary production, nutrient concentrations, secondary production, and fish community.

## **H. Research, Monitoring and Evaluation of Specific Section 7 Actions To Be Funded by Corps of Engineers and Bonneville Power Administration**

### **1. Shorty's Island habitat modifications : physical and biological monitoring to determine efficacy of placed substrates.**

- Physical monitoring will assess structure stability, rate of siltation and embedding, microhydrology, and surface roughness. Biological monitoring will include assessment of egg adhesion, hatching success, and larval cover and predator avoidance.

### **2. Ambush Rock habitat modifications: physical and biological monitoring to determine efficacy of placed substrates and flow alterations.**

- In addition to parameters above, biological monitoring will assess the physical effects of the places structures and substrate on attraction of spawning adult sturgeon.

### **3. Braided Reach: physical and biological monitoring to determine efficacy of structures.**

- Physical monitoring will assess structure stability, microhydrology as it relates to adult attraction and hydrological predator deterrence properties. Biological monitoring will include assessment of egg adhesion, hatching success, and larval cover and predator avoidance.

### **4. Egg Release Experiments**

- These experiments will test whether eggs placed in appropriate substrate will 1) lead to higher recruitment; 2) reduce egg predation; and 3) determine whether sturgeon imprint on incubation sites. They will also delineate the range of velocity necessary to consider in designing and placing habitat structures.

### **5. Ecosystem Restoration Flow Plan**

- In addition to the existing biological and hydrological monitoring previously described, monitoring of the effects of the specific enhanced flow regimes will include evaluation of any observed changes in response of fish to attempts to provide a more normative

thermograph (i.e. movement, duration in spawning reach, etc.), evaluation of operations provided to cue volitional movement of spawning adults to more suitable substrates (i.e. enhancing the local freshet), and evaluations of response to operations that target migration of backwater location to river reaches composed of coarse substrates.

- Additional monitoring related to normative hydrograph includes evaluation of effects on riparian rehabilitation (KTOI), volume/temperature/timing evaluations (i.e. proximity to normative function—Corps), bull trout responses (Montana FWP, ongoing), evaluation of stable flow related to nutrient addition experimentation (IDFG and KTOI), evaluation of increased varial zone in May and September (Montana FWP, ongoing), and evaluation of the effects of a functionally normative thermograph on conservation aquaculture operations (KTOI).

## REFERENCES

NWPCC, 2004. Kootenai River Subbasin Assessment. Northwest Power and Conservation Council, Portland, Oregon.